

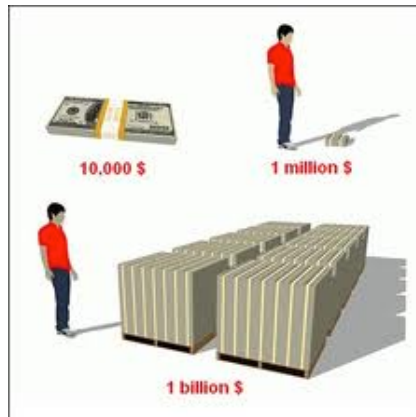
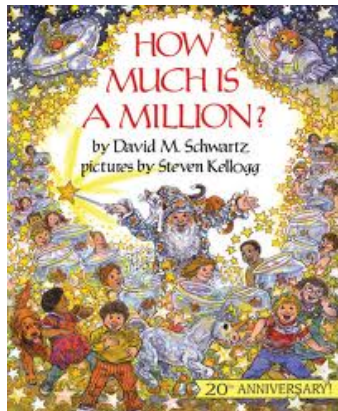
Chapter 9 Exponents & Scientific Notation

9.4 Zero and Negative Exponents

Unit Question: What is the power of powers?

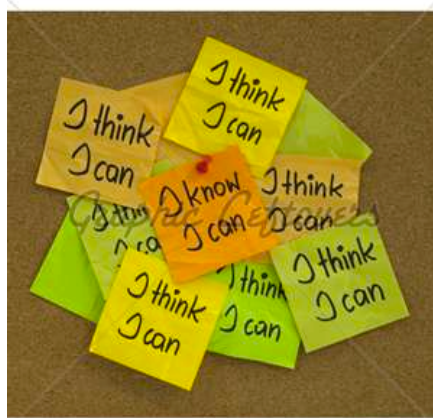
Learner Profile: Reflective

Area of Interaction: Community & Service



I Can Statement:

I can use the definitions of zero and negative exponents to evaluate and simplify expressions.



Quiz

Paper out and do!!!

1. $7 \cdot 7 \cdot m \cdot m \cdot m$

2. $(-2)^6$

3. $(3c)^4$

4. $\left(-\frac{2}{7}p\right)^2$

5. $\frac{\pi^{15}}{\pi^3 \cdot \pi^9}$

6. **CRITICAL THINKING** Is $(ab)^2$ equivalent to ab^2 ?
Explain. (Section 9.2)

7. **EARTHQUAKES** An earthquake of magnitude 3.0 is 10^2 times stronger than an earthquake of magnitude 1.0. An earthquake of magnitude 8.0 is 10^7 times stronger than an earthquake of magnitude 1.0. How many times stronger is an earthquake of magnitude 8.0 than an earthquake of magnitude 3.0? (Section 9.3)

Read the example.

Talk about the following notation.

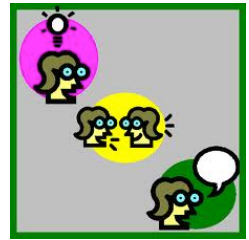
$$4327 = 4 \cdot 10^3 + 3 \cdot 10^2 + 2 \cdot 10^1 + 7 \cdot 10^{\boxed{}}$$

What patterns do you see in the first three exponents?

Continue the pattern to find the fourth exponent.

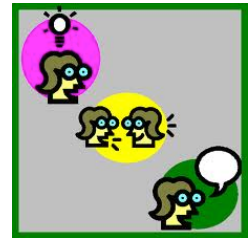
How would you define 10^0 ? Explain.

Think, Pair, Share



How would you
define 10^0 ? Why?

Think, Pair, Share



Compare the two methods used to simplify $\frac{3^2}{3^5}$. Then describe how you can rewrite a power with a negative exponent as a fraction.

<i>Method 1</i>	<i>Method 2</i>
$\frac{3^2}{3^5} = \frac{\overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{3}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{3}} \cdot 3 \cdot 3 \cdot 3}$ $= \frac{1}{3^3}$	$\frac{3^2}{3^5} = 3^{2-5}$ $= 3^{-3}$

On your paper with quiz, answer the question.

Think, Write, Share

IN YOUR OWN WORDS How can you define zero and negative exponents?
Give two examples of each.

1 minute to write, then I
will say when to share.



Key Ideas

Zero Exponents

Words Any nonzero number to the zero power is equal to 1. Zero to the zero power, 0^0 , is *undefined*.

Numbers $4^0 = 1$

Algebra $a^0 = 1$, where $a \neq 0$

Negative Exponents

Words For any integer n and any number a not equal to 0, a^{-n} is equal to 1 divided by a^n .

Numbers $4^{-2} = \frac{1}{4^2}$

Algebra $a^{-n} = \frac{1}{a^n}$, where $a \neq 0$

What if you have $\frac{1}{a^{-n}} = a^n$ $\frac{3}{a^{-2}} = 3a^2$

Write using
positive exponents

Evaluate the expression. Put on paper.

1. 4^{-2}

$$\frac{1}{4^2}$$

$$\frac{1}{16}$$

2. $(-2)^{-5}$

$$\frac{1}{(-2)^5}$$

$$\frac{1}{(-2)(-2)(-2)(-2)(-2)}$$

$$\frac{1}{4 \quad -8 \quad 16 \quad -32}$$

$$\frac{1}{-32}$$

3. $6^{-8} \cdot 6^8$

$$\frac{1}{6^8} \cdot \frac{6^8}{1} = \frac{6^8}{6^8} = 1$$

Evaluate the expression. Put on paper.

4. $\frac{(-3)^5}{(-3)^6}$

$$\frac{1}{(-3)^1} \\ (-3)^{-1}$$

5. $\frac{1}{5^7} + \frac{1}{5^{-4}}$

$$\frac{1}{5^7} \cdot \frac{5^4}{1} = \frac{1}{5^3}$$

Evaluate the expression.

Put on paper.

$$\frac{-2a^3}{10a^8}$$

$$\begin{array}{c} -1 \quad a \cdot a \cdot a \\ \hline 5 \quad a \quad a \quad a \quad a \quad a \quad a \quad a \end{array}$$

$$\frac{-1}{5a^5} = -5a^{-5}$$

Evaluate the expression.

Put on paper.

$$\frac{p^{-4}q^{-3}}{(p^5q^2)^{-1}}$$

Remember the previous lesson. Power of a power.

Put on paper.



Exit Quiz!!!

Simplify:

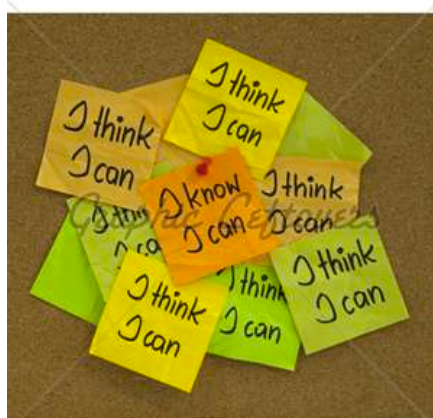
1. $4x^{-3}$

2. $\left(\frac{3x^5y}{8xy^7}\right)^0$

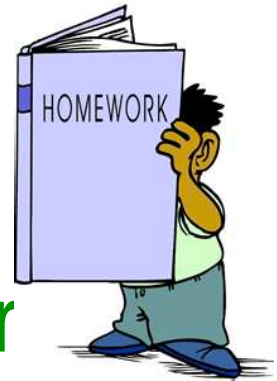
3. $\frac{18x^3y^4z^7}{-2x^2yz}$

I Can Statement:

I can use the definitions of zero and negative exponents to evaluate and simplify expressions.



Assignment:



Zero & Negative Power
Worksheet odds